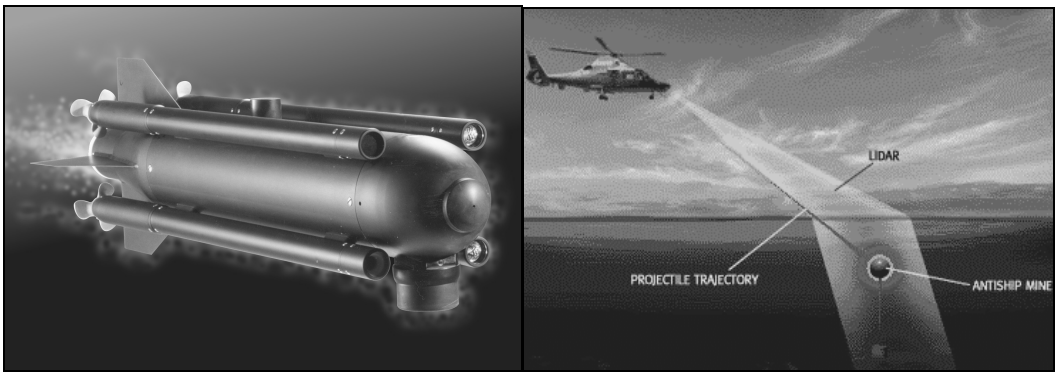
AIRBORNE MINE COUNTERMEASURES
RAPID AIRBORNE MINE CLEARANCE SYSTEM (RAMICS)
AIRBORNE MINE NEUTRALIZATION SYSTEM (AMNS)



The Rapid Airborne Mine Clearance System (RAMICS) and the Airborne Mine Neutralization System (AMNS) are two of five modular Airborne Mine Countermeasures systems that will be integrated into the MH-60S helicopter to provide Carrier Battle Groups and Amphibious Ready Groups an organic mine countermeasures capability. These systems will reduce the time required to locate and neutralize mines and thus contribute to dominant maneuver in the littoral battle space and full dimensional protection from enemy mines.

RAMICS will be the first U.S. Navy weapon system to use the supercavitation phenomenon, which surrounds underwater objects traveling at high speed in a gas bubble that greatly reduces drag and allows them to maintain high velocity. RAMICS will use a laser imaging detecting and ranging (LIDAR) system to reacquire floating and near-surface moored mines detected previously by other systems and direct gunfire to neutralize or disable the mines from a safe distance. Once the target is reacquired, a fire control subsystem will automatically track the target and aim the LIDAR and the gun. The RAMICS munition is a flat-nosed 30mm armor-piercing, supercavitating projectile designed to be directionally stable in both air and water. The projectile will be fired in bursts from a MK44 Bushmaster II gun, which is also planned for installation in the AAAV and LPD 17.

AMNS will be integrated into both MH-53E and MH-60S helicopters. Derived from a system built for German Navy mine countermeasures ships, AMNS will provide the capability to relocate, identify, and neutralize bottom and moored mines directly from the mine countermeasures helicopter. Target location information obtained from other sources will be entered into AMNS prior to take-off or while the aircraft is flying to the area of operations. The aircraft will then hover at a safe distance from the target and lower an expendable, self-propelled neutralizer device into the water. Once released, the neutralizer travels to the target position to commence a search for the target. It relays depth, position, and sensor (sonar and video) information to the operator in the helicopter via a fiber-optic cable. The cable is also used to send control and guidance commands to the neutralizer. Once the target is relocated and identified as a mine, the expendable neutralizer is positioned so that its shaped-charge will detonate into the vulnerable area of the mine. A successful mine neutralization attempt will render the mine inoperable either by rupturing its case or preferably by sympathetic detonation of the mine charge. A reusable training version of the neutralizer is also being procured with the system. The MH-53E will carry multiple neutralizers.

BACKGROUND INFORMATION

RAMICS began as an Advanced Technology Demonstration (ATD) in FY98 and culminated in a full-scale demonstration of mine neutralization from a Cobra helicopter in the underwater explosion pond at Aberdeen Proving Ground, MD. Testing was also performed at the Naval Air Warfare Center, China Lake, CA, where 20mm supercavitating projectiles were fired from a platform-mounted Cobra gunship into surrogate mine targets located in a large water tank. Applicability of the ATD testing to the current RAMICS concept is limited because it used 20mm projectiles instead of the 30mm version subsequently selected. Additionally, the surrogate mine targets used for ATD testing were not fully representative of RAMICS threats.

An AMNS technology demonstration was conducted in 1997, and open-water testing was completed in 2000. Shipboard suitability testing was conducted onboard USS *Inchon* (MSC 12), USS *Peleliu* (LHA 5), USS *Boxer* (LHD 4), and USS *Ogden* (LPD 5) in 2000. Aquarium tests, performed in a water tank at Fort AP Hill, were completed to determine the lethality of the shaped-charge warhead against threat-representative plate targets.

TEST & EVALUATION ACTIVITY

AMNS DT-IIA (MH-53E integration testing) was conducted during March and April 2001, at the Naval Surface Warfare Center, Dahlgren Division, Coastal Systems Station, Panama City, FL. DT-IIB (TECHEVAL) commenced on May 3, 2001, also at the Coastal System Station. The first phase of DT-IIB was conducted from the research vessel *Athena* using MH-53E AMNS subsystems with training neutralizers. This testing, a portion of which was observed by DOT&E, was conducted in shallow and deep operating areas containing inert U.S. and foreign mine shapes. Testing then moved to the MH-53E helicopter to evaluate helicopter integration, system installation and operating procedures, weapons loading/unloading procedures, in-flight safety, and system performance when operated from the helicopter. This testing was also conducted using training neutralizers in shallow and deep fields containing inert mine shapes and other mine-like objects.

DOT&E observed RAMICS Phase I Lethality Tests conducted in August and October 2001 at the West Freugh Test Facility in southwest Scotland. In these tests, production-representative RAMICS projectiles were fired at six U.K. MK17 mines from a platform-mounted MK 44 Bushmaster gun. These tests were well-instrumented and provided projectile velocity and lethality data for further analysis. Three RAMICS safe standoff tests were conducted during FY01 at the Energetic Materials Research and Testing Center, Socorro, NM, using mine targets that are considered the worst case for fragments. These tests helped to collect fragment mass and velocity data, which will be used in a Naval Air Systems Command model to determine the safe standoff distances for the MH-60S helicopter to avoid being hit by fragments from exploding mines.

TEST & EVALUATION ASSESSMENT

The OT and LFT&E strategies for RAMICS and AMNS have not yet been approved by DOT&E. Although details remain to be worked out, the test programs outlined in the draft AMNS TEMP should support an adequate assessment of AMNS effectiveness and suitability, including neutralizer lethality and potential vulnerabilities to aircraft and ships carrying AMNS. AMNS demonstrated the capability to launch training neutralizers, relocate mine targets, and correctly position the neutralizer for mine

neutralization during testing observed by DOT&E. DT of expendable neutralizer performance against inert and live mines has been delayed pending identification of a suitable site for live-on-live testing and correction of a communication problem between the neutralizer and helicopter-based system components.

Completed RAMICS T&E activities have demonstrated that the system concept is viable and have generated significant data on RAMICS lethality and host aircraft vulnerabilities, providing a good foundation for LFT&E. The results of the RAMICS Safe Standoff (SSO) Tests conducted in Socorro, NM, indicated that fragments from detonating a worst-case surface threat mine were more lethal than expected, and may require a greater SSO distance than originally expected for the helicopter firing the RAMICS projectile.

Phase I Lethality Tests conducted at the West Freugh Test Facility in Scotland showed that the RAMICS projectile is capable of penetrating the casing of a large near-surface mine, causing it to sink. Although the water characteristics (salinity and depth) and the target mine depths were considered mission representative, the projectile travel distance was significantly limited by the range facilities, and the sensor and fire control components of the system were not tested.

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